

## **Cities as Sustainable Ecosystems<sup>1</sup>**

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<sup>1</sup> The 3<sup>rd</sup> Annual Wege Lecture, Center for Sustainable Systems, University of Michigan, Anne Arbor

## **Abstract**

The United Nations Environment Program has facilitated a process of examining how cities can begin to change by learning from natural ecosystems. Ten principles (the Melbourne Principles) have been developed – vision, economy and society, biodiversity, ecological footprint, model cities on ecosystems, sense of place, empowerment, partnerships, sustainable productions and consumption, governance and hope. These are examined and illustrated to demonstrate the strength of the concept and their relevance to the future of cities: The paper suggests that innovation often has used mimicry of natural systems and the ecocity movement globally is showing how this can be done.

## **Introduction**

Peter Wege had a 'life changing experience' while flying a training plane over Pittsburgh when the city's smog prevented him from seeing the airfield. This paper is part of that tradition – it examines the work of many people who have sensed that cities have lost their way in the 20<sup>th</sup> century and need to rediscover a more fundamental understanding of how to exist more sustainably.

My own personal journey was strongly influenced by living in the San Francisco Bay area during the first oil crisis when oil vulnerability became a living reality. The dramatic comparison between how the Bay area coped and how Dutch cities coped where I had just lived for a year led me to research cities, to invent the concept of 'automobile dependence'<sup>2</sup>, to collect data on cities and their energy use for the past 25 years with my colleague Jeff Kenworthy, and to get involved in the policy and politics of how cities change<sup>3</sup>

So much of what I now do is wrapped up in the word sustainability and thus I have spent the past two and a half years working with the Premier of our State, Western Australia, on developing a State Sustainability Strategy. This was an intensive learning experience and confirmed for me that sustainability as suggested by Myersin and Rydin (1996) is the "post modern grand narrative" of our age. It is a magic word that evokes deep and creative responses from businesses, communities, and public servants. From these experiences of working to find partnerships between business, community and government I have found that whole new ways of thinking are emerging. Universities can easily be bypassed in this "grand narrative" as they were not the key drivers over the past thirty years. It has been a delight for me to find at Ann Arbor some real examples that disprove this general rule, and to see other emerging centers, like my own institute, where sustainability is the driving motivation.

But it is important to see that sustainability came out of a process of global politics as people from around the world, like Peter Wege, saw that the global environment was rapidly deteriorating. Rachel Carson in 1962 did more to dramatise this than most and universities played their part in researching and teaching about environmental science from the 1970's as they created a new science at the ecosystem scale. But then the great global gulf emerged in the 1980's between the ecological view that progress was now polluted and development should therefore stop, and the economic view, particularly in the third world, that development was essential to provide the basic needs of a billion poor people and to meet aspirations of people everywhere. A real crisis in global politics was emerging as a result of this conflict.

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<sup>2</sup> Newman P and Kenworthy J (1989) **Cities and Automobile Dependence**, Gower, Aldershot.

<sup>3</sup> Newman P and Kenworthy J (1999) **Sustainability and Cities: Overcoming Automobile Dependence**, Island Press, Washington DC.

The United Nations stepped in and began the World Commission on Environment and Development where the concept of sustainable development emerged<sup>4</sup>. This Concept suggested:

- Development in the poor world was necessary and that many global problems (including environmental problems) could not be solved without it;
- Development in the rich world had to be fundamentally reshaped so that it did not require more resources and cause more environmental problems but would be a positive force on the environment.

Thus a more positive approach to development was created but it depended, for its credibility on business, government and communities creating a totally new professional approach to development based on partnerships and integration rather than competition and isolated disciplines of knowledge and practice.

The United Nations then asked the world to contribute to demonstrating this concept. In 1992 the Rio United Nations Conference on Environment and Development began to show the first signs of what it might mean, especially with Agenda 21. Local Agenda 21 was launched with local governments and this movement began to integrate across professions and disciplines and was a pioneer in charting sustainability for professionals. Then in 2002 the Johannesburg United Nations Conference, the World Summit on Sustainable Development, confirmed that it was no longer an issue of economics and ecology (or as Peter Wege says 'economicology') but of integrating the social dimension as well into the economic and environmental. The states of the world (regional governments to some) then also formed their network (nrg4sd) like local government and began to create sustainability strategies. The Western Australian government in 2003 became the first state government to have a comprehensive sustainability strategy<sup>5</sup>.

Throughout this process, universities have not been at the center of how these concepts could be given meaning and purpose. This is mainly because of the great gulfs that exist between our modernist disciplines. We were in fact part of the problem, not part of the solution. To bring together social, economic and environmental realities is to attempt to "reconcile the irreconcilable" as suggested by Bradbury and Raynor<sup>6</sup>. To integrate descriptive, quantitative knowledge and interpretive, qualitative knowledge, the logic data and the strategic dialogue, the left and the right brain... My experience of this integration is that is possible but that mostly it occurs off the campus where the rigidities of thinking can be overcome in new partnerships of learning on the job or in the community<sup>7</sup>. The emergence of new university institutions that can create partnerships between business, economy and communities is now beginning – but they are rare treasures.

The emergence of sustainability as the grand narrative of our time has not been much related to cities. This is partly because of the scale of the effort being directed at nations or at local government and partly due to disciplinary gulfs. This is now

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<sup>4</sup>WCED (1987) **Our Common Future**, Oxford University Press, Oxford.

<sup>5</sup> Western Australian Government (2003) **Hope for the Future: the State Sustainability Strategy**, Department of the Premier and Cabinet, Perth, WA.

<sup>6</sup> Bradbury J and Raynor S (2002) Reconciling the Irreconcilable, in Abaza H and Baranzini, (eds) **Implementing Sustainable Development: Integrated Assessment and Participatory Decision-making Processes**, Edward Elgar Publishing, UK.

<sup>7</sup>Some of these approaches are outlined in our book on CASE, Newman P and Jennings I (2004) **Cities As Sustainable Ecosystems**, UNEP-IETC, Kobe, Japan.

changing and we are seeing the emergence of what I call the ‘ecocities’ movement globally.

The United Nations Environment Program has recognized this movement and in 2002 called a meeting of key people to develop a set of principles for a new program they called CASE – Cities As Sustainable Ecosystems. The process was set in motion by a meeting in Melbourne, Australia, which developed ten principles for CASE (see box 1).

<b>Box 1: The Melbourne Principles</b>	
1. VISION	Provide a long-term vision for cities based on: intergenerational, social, economic and political equity; and their individuality.
2. ECONOMY & SOCIETY	Achieve long-term economic and social security.
3. BIODIVERSITY	Recognise the intrinsic value of biodiversity and natural ecosystems, and protect and restore them.
4. ECOLOGICAL FOOTPRINT	Enable communities to minimise their ecological footprint.
5. MODEL CITIES ON ECOSYSTEMS	Build on the characteristics of ecosystems in the development and nurturing of healthy and sustainable cities.
6. SENSE OF PLACE	Recognise and build on the distinctive characteristics of cities, including their human and cultural values, history and natural systems.
7. EMPOWERMENT	Empower people and foster participation.
8. PARTNERSHIPS	Expand and enable co-operative networks to work towards a common, sustainable future.
9. TECHNOLOGY	Promote sustainable production and consumption, through appropriate use of environmentally sound technologies and effective demand management.
10. GOVERNANCE & HOPE	Enable continual improvement, based on accountability, transparency and good governance.

This paper will discuss these principles and how we have tried to flesh them out as a book to illustrate and expand CASE. The paper will therefore be structured to elaborate on each of the principles.

There are several core ideas that come out of CASE and these will be listed at the end but all the principles are based on the notion that innovation usually comes out of how we learn from nature; cities need to do this to become more sustainable. The obvious principle in which this is stated is Number 5 ‘Model cities on ecosystems’, but all of the Melbourne Principles can be interpreted that way – and this is the theme of how we have constructed and illustrated the book. Ecosystem-oriented

approaches (as will be outlined) are based on networks of support, mutuality, closed loop cycles... and a close awareness of how the ecosystem support services are integrates into the daily life of the city.

**PRINCIPLE 1: VISION**

*Provide a long-term vision for cities based on intergenerational social, economic and political equity, and their individuality*

This principle suggests that you need to ask people in cities what it is that sustains them. The visions which keep cities alive and provide motivation for long-term planning can be obtained from various processes<sup>8</sup>. When this is done, invariably it provides visions of the future, which use biological or ecosystems-based metaphors for how cities should be.

There are vision statements in the Earth Charter and the Healthy Cities principles from WHO which all stress the need for an interactive, mutually supportive, ecologically oriented city. Cities like Portland have such a statement and more and more cities, following the United States Environmental Protection Agency’s Green Community Visioning, have such statements.

One such vision process has occurred recently in my own state and city. The process of the State Sustainability Strategy was used as a visioning process and for settlements the model agreed upon to use as the basis of the future was a biological one: the Extended Metabolism Model<sup>9</sup>.

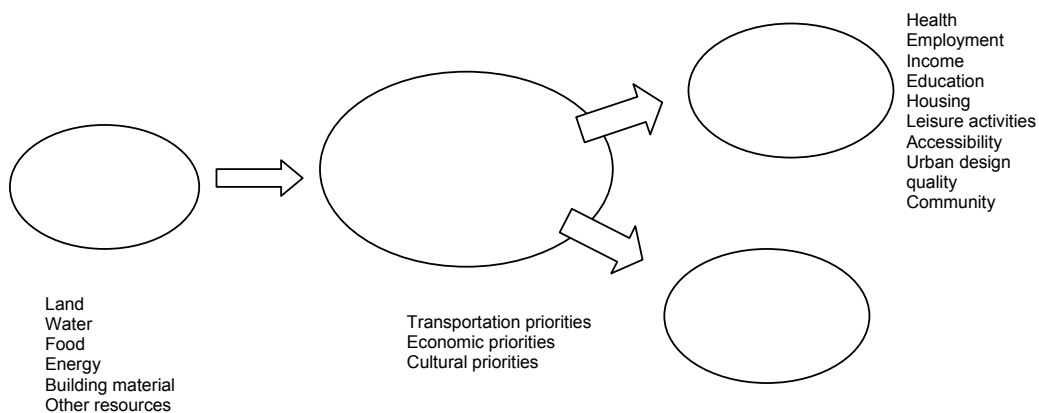


Fig 1 Extended Metabolism Model of sustainability in cities. Source: Newman and Kenworthy, 1999.

<sup>8</sup> For example Sarkissian W, **Community Participation in Practice**, a series of 6 books available form ISTP, Murdoch University, Perth, Western Australia.

<sup>9</sup> This is based on our book Newman and Kenworthy (1999) **Sustainability and Cities**, Island Press, Washington DC.

This model recognizes that cities are consumers of resources and producers of wastes based on a metabolism process. However cities are not just flows of energy and materials, they are designed to use these flows to create livability. Thus one of the eleven principles adopted in the State Sustainability Strategy was:

“Sustainability recognizes that settlements need to reduce their ecological footprint (i.e. less material and energy demands and reductions in waste) while they simultaneously improve their quality of life (health, housing, employment, community...)”.

The Settlement’s vision statement was therefore:

“Western Australia’s Settlements are among the most attractive places to live in the world, constantly becoming more innovative and efficient in their use of resources and management and use of wastes whilst simultaneously becoming more livable and equitable”.

Vision Statements can be dismissed as just words, but visions that encapsulate a clear principle can lead to change. The reality is that cities in the past have used more and more resources and wastes to create livability. The challenge for cities now is to decouple these processes and produce livability improvements whilst reducing resources and wastes.

In the end cities, like organizations live off their ideas – ideas that change thinking and thinking changes culture. Sustainability offers a new chance to examine a city’s ideas – their vision. And sustainability provides an open-ended framework for them to assess their present ideas, which most importantly is a global and local set of ideas and hence is relevant to the global economy.

## **PRINCIPLE2: ECONOMY AND SOCIETY**

*Achieve long term economic and social security*

City economies have existed for 8000 years based on innovation, divisions of labor, economies of scale and the opportunities created by all this. Cities have grown enormously in the past 100 years as urban populations increased 20 fold while global population has increased 4 fold. The developing world is flocking to cities with 2.3%/annum urban growth compared to 0.1% in rural areas, and much of this is concentrating in Megacities of more than 10 million.

The driving force behind this process is globalization of the economy which is tending to favor development of one major city in each region. Globalisation is a powerful force – it is based on the processes of global competition. There seems little likelihood of the fundamentals of this process changing but there is increasing awareness that it is not enough in itself. There are social and ecological issues that impact on cities which are not part of globalised economic and financial processes. Sustainability is suggesting that these matters cannot just be forgotten or neglected.

Thus within a globalised urban economy a city needs to assert two other scales of importance to decision making: **the bioregional scale and the local community scale**. The bioregional scale is where a city’s natural resource base, its ecosystem services, can be assessed and managed. This is a city’s natural capital base. The local community scale is where social matters mean most. This is a city’s social capital base.

Sustainability can operate at these scales by leavening or adapting the global urban economy scale. These three scales – global economic, bioregional and local community scales - are not separate of course but are closely linked. Robert Putman’s analysis of wealth in regions shows that it is closely linked to reciprocal

relationships of networks based on mutual trust<sup>10</sup>. He demonstrated that competitive relationships alone will eventually drive an economy into decline as it degrades its natural resource base and undermines communities and the trust essential for economic activity. His research was on the long term analysis of two regions in Italy covering hundreds of years.

Globalisation is not new but its hard edge asserting that markets based on competition alone will determine everything, is relatively new, and it will not be sustainable. This is indeed a key rationale behind why sustainability has been created, globally.

The response to globalised economies in cities by the eco-city movement is to assert the value of local community through eco-villages and similar community initiatives, and the value of bioregions through urban agriculture, urban catchment water planning, regional recycling, complementary currencies, true costing, buy local and ecolabelling of bioregional products.

### **PRINCIPLE 3: BIODIVERSITY**

*Recognise the intrinsic value of biodiversity and natural ecosystems, and protect and restore them.*

It is not new to assert the value of biodiversity and its inherent qualities. It is the job of CASE to try and show what this can mean for cities – places where biodiversity is not generally seen as important.

Biodiversity is necessary to assist whenever ecosystem services for cities are discussed. Natural cycles are all of relevance to cities and all are dependent on a diversity of life forms networked together. We don't always understand how these work, especially when modified by invasive species or by intensive human use. The science of such urban ecosystems needs to be studied – ecologists are needed in cities as well as outside of them. Remarkable linkages between human activity and nature can be facilitated, for example giant goannas have found a home in Perth's Karrakatta cemetery and there is little understanding of the mixture of new species that fit together to make urban ecosystems.

There are new ways that the city can be an 'ark' for biodiversity. Zoos have traditionally played this role and they will continue to be important. However there are ways that the city itself can build in biodiversity roles. One obvious way is by connecting representative reserves through corridors that can be maintained in a city's region (for example the Gondwana Links Project is an Australian version of projects across the US by the Nature Conservancy). Other ways are through small reserves, nurseries and gardens where the benefit of cities, i.e. intensive labor processes, often of a voluntary nature, can be turned to biodiversity's advantage.

In Jakarta a project by Harry Harsono Amir has shown how traditional Talun agriculture using a diversity of chicken species almost extinct across Java were raised in a suburban home and taken to the village of Sukabumi where a co-operative of local farmers now produces them. Similarly, medicinal plants and

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<sup>10</sup> Putnam R (1993) **Making Democracy Work: Civic Tradition in Modern Italy**, Princeton University Press, Princeton.

aquaculture species were grown in the suburban home and then used to help provide a better local and bioregional economy, ecology and community<sup>11</sup>.

Perth is a city set in one of the biodiversity 'hotspots' of the world. From very early it established native bush reserves, preserved foreshore areas and forest reserves in its bioregion. Finding ways for the city to assist its bioregion is now a major agenda for state and local government. The first species to be removed from the IUCN endangered species list is the Woylie. This was achieved in the Perth bioregion due to a combination of feral animal management and intensive reserve management – including private reserves paid for by ecotourists and bush regeneration techniques.

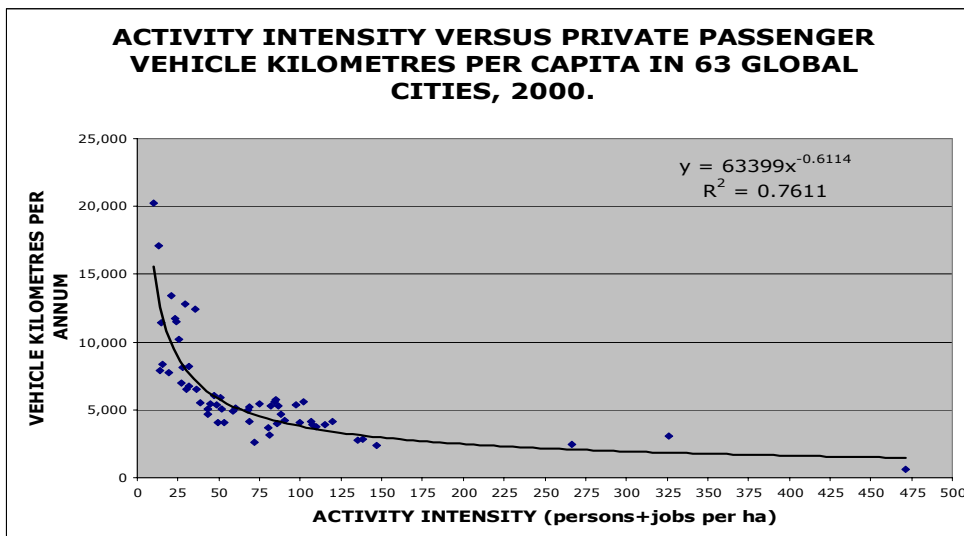
Such biodiversity activity requires dramatizing and cities around the world are beginning to have 'bioregional celebrations' that bring cultural credibility to such issues. Landscape architecture and green organic architecture that builds with the processes of nature can also contribute to biodiversity, especially ecovillages committed to Permaculture<sup>12</sup>.

#### **PRINCIPLE 4: ECOLOGICAL FOOTPRINT**

*Enable communities to minimize their ecological footprint*

This principle is central to sustainability: cities need to take less from the earth. The ecological footprint concept has shown how cities consume the world far beyond their borders and bioregions.

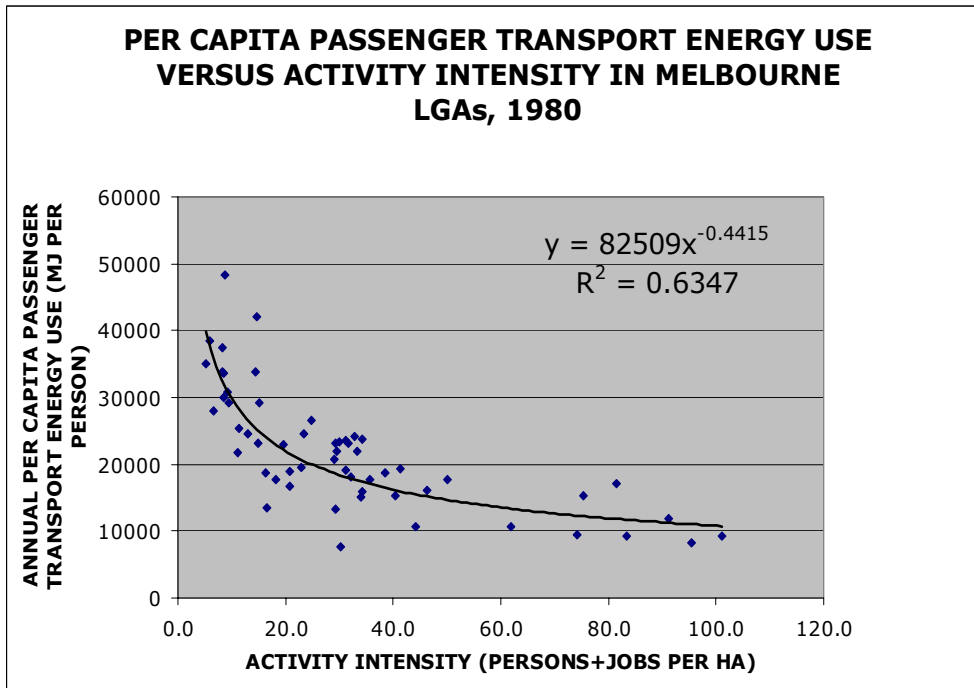
Asserting a more bioregional economy can help to minimize this but it is more likely to be effective when the structural side of the city is understood. One thing that comes through very clearly is that the ecological footprint of a city is determined largely by the size of the shoe. The area of the city is closely linked to its energy consumption (and to water, waste and obviously land-based impact). Thus as Figure 2 shows transport energy per person is closely related to urban density. The same pattern can be seen within cities as well (Figure 3).



<sup>11</sup> Amir H (2002) Talun Agriculture, in **Sustainable Development Case Studies**, ISTP, Murdoch University.

<sup>12</sup> VanderRyn and Cowan (1996) **Ecological Design**. Island Press: Washington D.C..





### **PRINCIPLE 5: MODEL CITIES ON ECOSYSTEMS**

*Build on the characteristics of ecosystems in the development and nurturing of healthy and sustainable cities.*

This is the core principle of CASE and it is based on the idea that cities are systems with biotic and abiotic components like ecosystems. They are at the scale of ecosystems in having bioregional scale and a local community scale with links to a global scale. They are using resources, managing wastes and building structures like an ecosystem. Therefore CASE tries to see how cities can learn from ecosystems, about how they should be or could be operating better as systems.<sup>13</sup>

<sup>13</sup> I am aware of the trap of using biological analogies to support political change e.g. how Social Darwinism was used to support master race theories and the problems of Eugenics. However this analogy of an ecosystem is part of a sustainability agenda which tries to find mutually reinforcing economic, social and environmental outcomes and builds on activities of tradition in settlements about building common good reciprocal relationships in cities. It is not biologically deterministic but is centred on traditions of human values and organic processes.

There are three models examined which together provide a nested set of ideas about how cities can model on ecosystems.

1. Adaptation of Bossel's principles for city form and structure which give high level policies and goals.
2. Ecosystem succession principles for city form and structure which give planning and design policies.
3. City shaping through transportation priorities – a social ecological approach which gives direct planning applications.

Together these approaches aim as Capra says "to bridge the wide gap between human design and the ecologically sustainable systems of nature"<sup>14</sup>.

#### **MODEL 1: Bossel's systems model**

Bossel<sup>15</sup> examined five principles of how ecosystems work and also how traditional societies work (adding 3 more principles) to combine into a set of 8 urban systems principles. The ecosystem principles and the traditional social-ecological principles are listed in Box 2 and Box 3.

- **Effective (healthy)**
  - autotrophic for energy in bioregion.
  - open to global ecosphere for materials but tight internal cycling.
  - biodiversity networks.
- **Zero Waste**
  - cycling matter.
  - filtration cascades.
- **Self regulating**
  - feedback loops.
- **Resilient**
  - self renewing based on panarchy (nested adaptive cycles to rebuild and renew), based on Holling.
  - diversity and ecological memory (based on Folke).
- **Flexible**
  - networks polycentric and bioregional.

#### **Box 2: Bossel's ecological system principles**

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<sup>14</sup> Capra, F. (2002). **The Hidden Connections**. London, Flamingo.

<sup>15</sup> Bossel, H. (1998). **Earth at a Crossroads: Paths to a sustainable future**. Cambridge, Cambridge University Press.

- **Ethical**
  - sustained by felt connections and stories of place.
- **Psychologically- fulfilling**
  - shared community roles to maintain place.
  - belonging/identity.
- **Co-operative (co-existing)**
  - meeting human needs through bioregional co-operation.

### **Box 3: Bossel's social-ecological system principles.**

As can be seen from these principles they are similar to the approach already outlined in the other principles. In general they emphasise the way that ecosystems work in mutually reinforcing and supporting networks which enable energy efficiency and tight material cycles and which builds in resilience and flexibility as well as human qualities. There is considerably more detail on each principle in our CASE book.

#### **MODEL 2: Newman's ecosystem succession principles for city form and structure.**

This model is based on work I did in 1975 at Stanford with Paul Ehrlich at the height of the first oil crisis<sup>16</sup>. I was witnessing a highly inefficient oil intensive city totally vulnerable to this change imposed from the outside impacting heavily on how the city operated day to day. I was also aware that European cities were much less vulnerable and wondered whether some kind of transition similar to the ecosystem succession transition would now occur as cities, like ecosystems, tried to optimize their energy and material flows.

The model is set out in table 1 (over)

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<sup>16</sup> Newman, P. (1975) An ecological model for city structure and development **Ekistics** 40(239): 258-265

## City Form and Structure as a Model of Ecosystem Form and Structure

	Young Ecosystem	Mature Ecosystem
<b>Energy &amp; material resources</b> Gross productivity Net productivity Efficiency  Trophic structure	Rapidly increasing Rapidly increasing Low - Wastage of energy & materials - Process inefficiencies  Producers mainly	Stable and less Zero High - Waste organic matter an important energy source - Recycling of materials - Conservation in the use of materials - Processes more efficient Balance of producers, consumers, decomposers and integrative species
<b>Space</b> Spatial efficiency	Low Dispersed form Low structural diversity - Small structures only - Lateral patterns only  - Small variety in shape	High Compact form High structural diversity - Structures both large and small - Lateral and vertical patterns (stratification) - Large variety in shape
<b>Information</b> Community diversity Community organisation	Low - Few functional niches - Generalists Low - Little interconnection	High - Many functional niches - Specialists High - Much interconnection
<b>Overall</b> Environmental control	Low - Resource availability external to biotic system - Climate unbuffered - System instability	High - Resource availability controlled within the biotic system - Climate buffered - System stability

It essentially suggests four core principles.

1. Energy and Materials

Pioneer ecosystems on newly emerging land or after fire or flood grow rapidly in energy flow then stabilise. Materials become more and more tightly linked and conserved as it matures. The urban ecosystem should likewise move from growth to efficiency and waste to recycling as it matures.

2. Land and Structures

Pioneer ecosystems grow from low dispersed structures to compact, mixed use, diverse structures as a means of making a resource efficient and more information rich ecosystems. The urban ecosystems should likewise move from sprawl to structures, diverse centers as the city matures.

3. Information

Pioneer ecosystems rapidly grow from monocultures few niches and mostly generalized species to a diverse, interconnected systems with much more complexity. In information terms it is vastly richer. The urban ecosystems should move from monocultures of structure and social/economic function to networks of social capital and a diverse economy as the city matures.

4. Control/Governance

Pioneer ecosystems grow from high resource vulnerability and system instability to greater internal control and system stability (resistance). The urban ecosystem needs to move from instability and resource vulnerability to governance/control and system stability as the city matures.

**MODEL 3: City shaping through transportation priorities (a social ecological model)**

This is the model that we have been working on for the past twenty years on what shapes cities.<sup>17</sup> It is based on a principle that seems to apply to all cities, and has for all time, about how humans structure their lives in settlements. It is called therefore a social-ecological model.

The key concept has been called the Marchetti Constant<sup>18</sup> of average travel time budgets: that in all cities, people travel on average one hour per person per day. This is clear in all the 100 cities we have studied in every continent and in the United Kingdom it was found to apply for the past 600 years of settlement<sup>19</sup>. The significance of this is that cities adapt so that they are always 'one hour wide'. This is best seen through a rapid urban history that shows there are three types of cities:

- **Walking Cities** were (and are) dense, mixed use areas no more than 5km across. These were the major urban form for 8000 years.
- **Transit Cities** from 1850-1950 were based on trams and trains which meant they could spread 20 to 30 kilometres with dense clusters of corridors following the rail lines and stations.
- **Automobile Cities** from the 1950's on could spread 50 kilometres in all directions and at low density.
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Most cities have some part of each of these city types. Many cities are reaching the limits of their urban form based on these transport systems. This is due to local and

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<sup>17</sup> Newman P and Kenworthy J (1999) **Sustainability and Cities: Overcoming Automobile Dependence**, Island Press, Washington DC. .

<sup>18</sup> Marchetti C(1994) Anthropological invariants in travel behaviour, **Technical Forecasting and Social Change**, 47(1): 75-78.

<sup>19</sup> SACTRA (1994) **Trunk Roads and the Generation of Traffic**, Department of Transport, London, UK, December.

global sustainability issues and helps us to see what are the key sustainability policies for cities.

The Marchetti constant means that when a city grows beyond its 'one hour wide' size it will begin to become dysfunctional in transport and human terms. Road rage is just one of these symptoms. A city with an average speed of 40 kilometers per hour and 100 people per hectare would become dysfunctional after 12 million; a city of 10 people per hectare and 50 kilometers per hour will become dysfunctional after 2 million people. Such limits are beginning to be seen and no obvious technological changes are going to change this. Electronic communication is not changing the need for human contact in cities.

This model shows that if a city wants to be compact then fast highways will inevitably undermine this. If a city wants to become more sustainable it must make a series of policy changes that include:

1. Favoring transit over traffic down major corridors.
2. Favoring walking/cycling over traffic in local areas.
3. Building walkable centers around the transit system (with densities of people and jobs over 35/hectare<sup>20</sup>)

This urban structure can fit within the bioregional and local community approach of CASE.

Data from our global cities study supports how cities will need to change their structural priorities which in the end come down to transportation priorities.

Figure 4 shows cities vary enormously in how much car use there is: Australian and American Auto cities are of course much higher in car use, they are double European cities on a per capita basis despite being less wealthy. So it is not an economic driver but a city structure driver that creates car dependence. This is even more obvious when comparing wealthy Asian cities (Tokyo, Singapore and Hong Kong) with developing Asian cities (Bangkok, Kuala Lumpur, Jakarta, Manila, Surabaya...); the rich Asian cities are ten times as wealthy but have the same or slightly less car use per capita than the poorer Asian cities (which is also around one tenth of cities, like Houston or Phoenix). Obviously some cities have invested more significantly in public transport and walking/cycling infrastructure than others as shown by the data in Figure 5.

The result is that some cities have faster transit than car traffic and hence have a real option to use sustainable modes. As shown in Figure 6 automobile dependent cities in America and Australia, in order to keep within the Marchetti Constant, make it virtually essential for people to choose car use as it is much quicker. In Europe and wealthy Asian cities it is quicker by public transport. In developing Asian cities a different kind of automobile dependence has emerged with cities structured for transit and walking but where no investment has occurred to support this; they therefore are choosing cars rapidly to enable them to keep their travel budgets in order as the alternative is buses stuck in traffic. Bangkok has terrible traffic with an average speed of 13 kilometers per hour, but its buses do no more than 9 kilometers per hour.

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<sup>20</sup> See Newman (2004) Sustainable Transport and Urban Design, in **Turning the Titanic**, CSIRO Books, Melbourne.

The result of this prioritizing of cars in cities is a growing series of unsustainable trends:

Economic – as Figure 7 shows the American and Australian cities have much higher transport costs as a proportion of their wealth and the worst of all is developing Asian cities. This is due to the sheer space of cars as well as their running and purchasing costs. Transit cities and walking cities are economically much more efficient.

Social – Road accidents as in Figure 8 vary mostly with car use and are an indicator of the disruption of cars to communities and the fear that now prevents even children walking to school.

Environmental – Emissions, greenhouse and sprawl are just part of this problem of cars. Energy underlines it all, especially oil which is peaking globally (Figures 9 and 10)

The idea of modeling cities on ecosystems begins with high level principles and ends with the stark reality of how we need to restructure our funding of transport. The concept of a city of urban villages linked by quality public transport beckons as the solution (Figure 11). With a city more oriented to local walkability, linked by corridors of transit priority it becomes feasible to manage other bioregional and local community ecological strategies.

### **PRINCIPLE 6: SENSE OF PLACE**

*Recognise and build on the distinctive characteristics of cities, including their human and cultural values, history and natural systems.*

There has been a long debate about how we view nature as human beings – from arrogant ideas that we can subdue nature as we are above it, to ideas of deep ecology that tend to see cities as foreign and separate from nature. CASE is an attempt to show that these distinctions do not work at either end of the spectrum – cities are part of nature and cities can work with nature. One of the key ideas that enable this to be pursued is ‘sense of place’.

Sense of place links us to a bioregion. Bioregions take us back through layers of history including indigenous history. Throughout the ages people have had their identities defined and their sense of belonging created by a particular bioregion. They also relate to the built environment of the city that may be thousands of years old and have grown organically out of that bioregion, or it may be a new suburb trying to find its sense of community.

By pursuing the natural history, the Indigenous history, and the built history of an area the people can begin to create “a sense of sanctity and worth of a particular place”<sup>21</sup> or as Thayer <sup>22</sup> says “they can re-inhabit a place which is the rediscovery of a way to live well with grace and permanence in a place”.

This is a major thrust of the eco-city movement – it redefines places with new insight into how we can more closely relate to our environment in cities.

CASE suggests there are a range of strategies for fostering sense of place: protecting important and symbolic elements of the natural and built heritage; making special places more visible, historical and natural (especially water courses in cities); connecting the city with its wider bioregion; using community arts to nurture

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<sup>21</sup> Lilburne, G. (1989). **A Sense of Place: A Christian Theology of the Land.** Nashville, Abingdon Press.

<sup>22</sup> Thayer, R. (2003). **LifePlace: Bioregional Thought and Practice.** Berkeley, University of California Press, p 68.

and deepen sense of place; and creating 'city songlines' i.e. special trails that build on urban places like an Indigenous perspective where a story of significance is told along the trail. As Leonie Sandercock said "For the longest time, 'story' was thought of in the social sciences as 'soft', inferior, lacking in rigour, or, worst insult of all, as a 'woman/native/other' way of knowing... But as Alasdair MacIntyre put it: 'I can only answer the question "What can I do?" if I can answer the prior question, ... "of what story or stories do I find myself a part?" "<sup>23</sup>

Sense of place requires people to relate to it at walking pace. You never respect or relate in depth to a place at 50 kilometers per hour. So sense of place and walkable urban design are closely linked.

### **PRINCIPLE 7: EMPOWERMENT**

*Empower people and foster participation.*

Empowerment through transparent and engaging public processes is critical to sustainability. The two have gone closely together and one cannot be imagined without the other. The reason for this is not just due to human rights - people should be engaged because it is their moral right - the issue is deeper, sustainability requires engagement from all people because the issues are too difficult to be resolved unless all the voices of difference are engaged in a strategic process. This is the approach that Aristotle called '2<sup>nd</sup> road thinking' as opposed to the '1<sup>st</sup> road' of 'logic'. The challenges created by globalization in cities are new territory and require us to undergo serious and deep conversation about how bioregional and local community responses can reclaim a future for cities. They require all the voices to be heard.

This kind of approach is also an ecosystem style of governance where each part of the system plays its role and is vital to the functioning of the whole system.

Strategies of empowerment in cities to pursue a more sustainable future include:

- Urban government commitments to empowerment (as in ICLEI programs);
- Education and healing circles;
- Using creative new techniques for different urban functions (e.g. Perth had a Dialogue with the City involving 1400 people directly and thousands more through the internet where they played a scenario game on future options).
- Focusing on engaging the most disempowered (various UN programs are set up to help with this e.g. urban basic services for the poor UBSP).
- Fostering the anti-freeway movement which is a strong and symbolic way to involve people in creating more sustainable options for cities.

### **PRINCIPLE 8: PARTNERSHIPS**

*Expand and enable cooperative networks to work towards a common sustainable future*

Partnerships, like empowerment are also synonymous with sustainability. The World Business Council on Sustainable Development created three scenarios.

1. FROG - First Raise Our Growth. It is not possible to have business creating wealth alone and allowing trickle down of its profits to enable social and environmental problems to be solved. FROG will not work says the WBCSD.

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<sup>23</sup> see Sandercock L (2003), **Cosmopolis II - Mongrel Cities**, p182, Continuum, London.



2. Geopolity - Government solving it from the top. This also will not work. Raising taxes hugely and dictating solutions is just as likely to fail – ‘government failure’ and ‘market failure’ have very similar records on sustainability issues.
3. JAZZ - Partnerships, synergies and flexibility. The solution according to the WBCSD is to play jazz between government, business and the community - create partnerships that push sustainability well beyond compliance in creative ways. Jazz has a theme and a direction but it is surprising and creates new possibilities every time it is tried. Jazz however is very hard and requires a lot of work behind the scenes.

Partnerships build on the networks so often referred to in CASE – the networks central to social capital, financial capital and natural capital.

Ecosystems are networks as Capra says “At all levels of life – from the metabolic networks inside cells to the food webs of ecosystems and the networks of communications in human societies – the components of living systems are interlinked in network fashion.”<sup>24</sup>

Partnerships within cities are creating the solutions to sustainability that is necessary: community-business partnerships, government-community partnerships and business-government partnerships as well as all three together. Examples include the Breman Initiative; Environment Sustainability Business partners; industrial ecology such as in Kwinana and Kalundborg; and the WA Collaboration (civil society partnership).

Partnerships between cities are also happening such as the ICLEI programs and the Global Ecovillages Network. Many more options are possible, especially to support procurement of sustainability products.

Partnerships between cities and their bioregions are beginning to appear e.g. Community-Supported Agriculture linking cities to farms, various City Farm projects and research projects that link cities and farmers such as CSIRO’s Healthy Country project.

These kind of partnerships are the very opposite of the competition agenda which has dominated international economics for the past few decades. Competition will remain as an important component of economic life but it cannot produce all the sustainability outcomes that we need. These will come only if we establish partnerships. At a 2004 UN Conference in Hong Kong on Sustainable Cities, the Mayor of Honolulu raised the possibility of a new kind of partnership linking sustainable cities administrations around the world through procurement projects for Hydrogen fuel cell buses, PV for city hall rooftops and innovative waste treatment systems. Such innovation is expensive but if cities got together in partnership then economies of scale can deliver them for much lower prices.

#### **PRINCIPLE 9: SUSTAINABLE PRODUCTION AND CONSUMPTION**

*Promote sustainable production and consumption through appropriate use of environmentally sound technologies and effective demand management*

The new agenda for cities as set out in all the models in CASE is reducing resources and waste. This is possible through the eco-efficiency technological innovation process known as Factor 4 (or even 10), i.e. reducing resource consumption by 50%

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<sup>24</sup> Capra, F. (2002). **The Hidden Connections**. London, Flamingo.

(or 90%) and at the same time doubling wealth.<sup>25</sup> Examples are appearing where such potential is feasible.

However it cannot be enough for cities just to hope for such an agenda as history does not suggest it will be efficient in total. Despite considerable technological efficiency improvements in the past, overall consumption has tended to rise. This is due to the Jevons effect – if efficiency makes a product cheaper then consumption will soon displace any resource efficiency gains.

Thus Principle 9 is for the simultaneous process of creating more sustainable production and consumption. This is not easy – it is a simultaneous challenge for public policy, community awareness and ethical reconsideration. Strategies for sustainable production and consumption include those listed in Box 2

Sustainable Production	Sustainable Consumption
<ul style="list-style-type: none"> <li>• Bioregional and community scale technology</li> <li>• Biomimicry (using nature to help with innovation, e.g. Natural step)</li> <li>• Eco-efficiency</li> <li>• Industrial ecology (sharing wastes and resources)</li> <li>• Technology assessment e.g./ ESTIS</li> <li>• Integrated technology support systems (synergies between food, water, waste and energy systems)</li> </ul>	<ul style="list-style-type: none"> <li>• Voluntary simplicity (community replacing consumption)</li> <li>• Demand management education programs (e.g. living smart)</li> <li>• Sustainable city procurement based on full life cycle analysis.</li> <li>• Taxing products based on resource consumption</li> </ul>

The sustainable production system in a city would become like a set of nested and networked systems as in an ecosystems. Production needs to be sufficient to provide for quality of life and community but not for the excesses of a totally consumerist society in a world which cannot support it.

**PRINCIPLE 10: GOVERNANCE AND HOPE**

*Enable continual improvement based on accountability, transparency and good governance*

Hope is about a deep belief in continual improvement not spectacular achievement but real change with a sustainable base. Hope is realistic about the problems cities face but recognizes that when the CASE principles are followed there is a chance to tackle them. However inherent to hope is the need for good governance systems where community, business and government are partners in the responsibility and real leadership is being shown.

In a recent study of Megacities 9 principles of good governance were announced by Talukder to assist cities to be governed for sustainability.<sup>26</sup>

<sup>25</sup> Hawkins, Lovins and Lovins (2000) **Natural Capitalism: The Next Industrial Revolution**, Earthscan, London.

<sup>26</sup> Talukder S (2004) **Managing Megacities: A Case Study in Metropolitan Regional Governance in Dhaka**, PhD Thesis, ISTP, Murdoch University.

### 9 Principles of Good Governance in Cities

1. A geographical area of responsibility that covers the full extended metropolitan area, encompassing the bioregion.
2. A strategic planning function that can provide a vision for how the city can address its land use problems sustainably.
3. A statutory planning function that can control development to ensure 'common good' outcomes consistent with the strategic plan.
4. A development facilitation function that can provide investment co-ordination, partnerships for infrastructure, and a local validation structure.
5. A transparent local process that can help define the 'common good' sustainability outcomes from development with all stakeholders.
6. A co-ordination mechanism to ensure planning and development are integrated.
7. A way of raising the finance for the above process from land development.
8. A strong link into the national government system to enable good political support.
9. New professional skills in sustainability and local participation.

(Source; Talukder 2004)

Good governance for sustainability in cities requires more than good systems. It also needs inspiration. It needs some powerful symbols that can represent hope to their citizens. Examples are given throughout CASE but perhaps one of the best is in the Cheonggyecheon Project of Seoul, Korea. This part of Seoul is in the historic centre where once a historic bridge was the link across the river – a bridge which in myth should be crossed during the New Year to bring luck. However, in the thrust to modernize the city, the historic bridge and the entire river had been covered by a huge freeway. It was a symbol of unsustainability on many levels. An NGO in Seoul (CPAK) ran a campaign to have the freeway removed, the river foreshores rehabilitated and the historic bridge restored. Mayoral candidates were challenged to sign on to the visionary project and the one that did was elected. Now the freeway is coming down, replaced by a mass transit system and the restoration process is being funded out of the urban renewal projects adjacent to the new river banks.

### CONCLUSIONS

There are probably six main ideas in CASE which I believe can help provide a more sustainable future for cities:

- Innovation frequently comes from modelling or learning from nature.
- Cities are growing due to economic globalisation - they need sustainability to leaven development.
- Bioregional and local community scale provides the focus for management and technology to address globalisation in cities.
- Reducing ecological footprint starts with transport priorities as they structure cities.
- Traditional wisdom and eco-city social movements are providing a revitalised 'sense of place' that can drive sustainability in cities.
- Leadership, transparency and engagement is needed in governance to provide hope for sustainability in cities.

The threat to cities posed by terrorism works against almost every one of the core CASE principles. Walkable cities where people freely mix and where they can move

easily on mass transit cannot be allowed to just disperse into sprawling suburbs of fear. CASE also provides the long-term solution to global injustice and lack of engagement that can be seen to lie behind terror. Cities will need to claim the future that CASE sees as feasible.

